

REMARKS

Claims 1-3, 6, 8-9 and 31-36 are pending. Claims 1 has been amended to limit the cell wall to a thickness of up to 7 mils. Support for this amendment is found in original claim 2. New claims 32-35 have been added and depend from allowed claim 3. Claims 32-35 correspond to original claims 4, 6, 8 and 9, respectively. Claim 36 depends from claim 1 and part of claim 9. The total number of pending claims is now twelve and the total number of independent claims is three. Accordingly, no additional fees are due.

1. Invention Disclosure Statement

Applicants request consideration of the attached Information Disclosure Statement pursuant to 37 CFR 1.97(c). Applicants authorize the Patent Office to debit deposit account number 03-3325 for the fee set forth in § 1.17(p). The IDS identifies US 6,159,893 to Kondo.

Kondo teaches a honeycomb structure and method of making the same. The honeycomb comprises a cordierite as a chief component and a chemical composition containing silica, alumina and magnesia. The honeycomb structure has partition wall thickness not larger than 250 microns (9.84 mils) and a porosity of from 45 % to 80%. For reasons similar to those argued *infra*, Kondo does not anticipate or obviate the pending claims. Furthermore, Kondo actually teaches against the present invention at col. 3, lines 60-67, where combining fine pores and high porosity is unacceptable because “the partitioning walls lose the strength.” Kondo, therefore, would not combine high porosity with small median pore size as taught by the present invention.

2. Claims Rejection Under 35 USC §103(a)

Claims 1, 2, 4, 6, 8-9 and 31 are rejected under 35 USC 103(a) as being unpatentable over US 4,888,317 to DeAngelis.

The Examiner argues DeAngelis discloses a ceramic honeycomb structure comprising a material similar to the pending claims, with porosities up to 60-80 %, pores in the range from 1-20 microns, and a wall thickness of 6 mils is recited. In fact, DeAngelis describes an open-cell porosity of up to 60% and a closed-cell porosity of 0-20%. It recites “up to 60 percent and/or 0-20 percent porosity, respectively.” “Respectively” pertains to the open-cell and closed-cell porosities and is not cumulative. DeAngelis does not teach porosities of 60-80%. The Examiner also argues the DeAngelis article includes similar materials as the

pending claims and, therefore, would have similar coefficient of thermal expansion (CTE) and modulus of rupture (MOR) strength. Notably, DeAngelis does not include any data pertaining to light-off or MOR strength. For the following reasons, Applicants believe DeAngelis does not render pending claims as obvious.

Claims 1 and 31

Claim 1 includes a ceramic honeycomb substrate comprising a plurality of cells with a wall thickness greater than 2.0 mil and up to 7 mil, a porosity of 45-75% in which the median pore size is 2-10 microns, and a coefficient of thermal expansion of less than $15 \times 10^{-7}/\text{C}$ from 25-800 C. Claim 31 recites a ceramic honeycomb substrate comprising a plurality of cells with a wall thickness from 2.5-7 mil, a porosity of 50-65% in which the pore size is 2-10 microns, and a coefficient of thermal expansion of less than $15 \times 10^{-7}/\text{C}$ from 25-800 C. Claims 1 and 31 describe a particular honeycomb that synergistically combines low mass, high porosity, thin walls and small median pore size to create a honeycomb with high strength and capable of superior light-off characteristics.

For convenience, a chart is provided with the ranges of the DeAngelis and claims 1 and 31 of the present invention.

	DeAngelis	Claim 1	Claim 31
Wall thickness, mils	6	2-7	2.5-7
Porosity, %	0-60	45-75	50-65
Pore size, microns	1-20	2-10	2-10
CTE, $10^{-7}/\text{C}$ (25-800 C)	NA	< 15	<15

As can be seen, DeAngelis and the pending claims share an overlapping range for porosity; while DeAngelis completely contains the pore size of the claims. DeAngelis does not describe CTE at all. Further, the DeAngelis specification does not even mention light-off or mechanical strength. DeAngelis teaches only one wall thickness, which is within the range of claims 1 and 31.

Applicants believe the Examiner has erroneously considered the present invention a mere species of applied DeAngelis. Claims 1 and 31 teach porosity that is at least partially outside of DeAngelis. Even assuming the claims are a species of the DeAngelis genus, “[i]t is well established that the disclosure of a genus claim in the prior art is not necessarily a disclosure of every species that is a member of that genus.” Atofina v. Great Lakes Chemical Corp., 05-1359, 13 (Fed. Cir. 2006) (citing In re Baird, 16 F.3d 380, 382 (Fed. Cir. 1994)).

The Atofina court reversed a finding of anticipation where prior art described an overlapping temperature range. The prior art included a broad temperature range of 100-500 C whereas the claims described a range of 330-450 C. The court found that “no reasonable fact finder could conclude that the prior art describes the claimed range with sufficient specificity to anticipate this limitation of the claim.” *Id.* at 14. Unlike Atofina, claims 1 and 31 teach a porosity range that is at least partially outside of DeAngelis, so the claims are not truly a species of the DeAngelis genus.

Assuming arguendo claims 1 and 31 are species of DeAngelis, MPEP § 2144.08 describes several factors to be considered when determining obviousness of a species claim including:

- a) Size of the genus;
- b) Express teaching in prior art;
- c) Teachings of structural similarity;
- d) Teachings of similar properties or uses;
- e) Predictability of technology; and
- f) Any other teaching to support selection of the species.

Applicants believe these factors require allowance of the claims. DeAngelis (a) teaches a large genus encompassing porosity from 0-60% and median pore size from 1-20 micron, (b) claims agglomerate inclusions that do not require porosity, (c) permits closed-cell pores as an option, (d) avoids reference to the main problems solved by the present invention, that is, improving light-off while maintaining strength of the honeycomb. One skilled in the art would also appreciate that (e) the technology of ceramic honeycombs relating to strength, light-off and catalytic activity is not predictable. Finally, (f) the Examiner has provided no teaching, suggestion or motivation that would suggest the selection of the species from the broad teaching of DeAngelis.

DeAngelis teaches (1) a single wall thickness in the claimed range, (2) an extremely broad range for porosity that only partially overlaps the present claimed range, and (3) a range of median pore size more than double that of the present claim. The specification of this application makes clear that high porosity is essential for fast light-off. See, e.g., paragraph 0018. Applicants determined that high porosity reduces thermal mass and, ultimately, light-off. To this end, the present invention requires a porosity of at least 45%. By contrast, DeAngelis permits porosity to be as little as 0%. DeAngelis may have zero

porosity because the catalyst agglomerates are entrapped in the body of the structure during the manufacture of the structure. Certainly, a structure with zero porosity would have significant thermal mass and quite inferior light-off. Accordingly, within the claimed range of the present invention fast lightoff is achieved. The property of fast lightoff is neither taught, suggested, or motivated by DeAngelis.

Claims 1 and 31 also teach a wall thickness from 2-7 mils and a pore size of 2-10 microns. The thin wall thickness decreases thermal mass and, therefore, improves light-off. Thin walls would normally decrease strength; however, when combined with small pore size from 2-10 microns, maintain the strength of the honeycomb. Accordingly, it should be recognized the synergistic combination of high porosity from 45-75%, thin walls from 2-7 mils, and small pore size from 2-10 microns produces a honeycomb with fast light-off and high strength. One skilled in the art would not be motivated to select this combination from the broad description in DeAngelis. Respectfully, claims 1 and 31 are believed allowable over DeAngelis.

Claims 9 and 36

The Examiner argues that the structure of DeAngelis would inherently possess a MOR strength of at least 200 psi. Applicants believe the Examiner's reliance on inherency is erroneous. A *prima facie* case of obviousness exists only when the Examiner provides:

1. one or more references;
2. that were available to the inventor;
3. that teach or suggest to combine or modify the references;
4. the combination or modification of which would appear sufficient to have made the claimed invention obvious to one of ordinary skill in the art.

Applicants do not believe DeAngelis inherently teaches all elements of claims 9 and 36, specifically a MOR strength of at least 200 psi. “[I]nherent disclosure is appropriate only when the reference discloses prior art that must necessarily include the unstated limitation.” *Atifino*, at 16.

Unlike the present invention, DeAngelis requires the catalyst to be entrained in the walls of the substrate. Entrained catalysts function as inclusions that decrease the strength of the substrate. Accordingly, the DeAngelis catalyst support would have MOR strength well below 200 psi. Further, the entrained catalysts of DeAngelis are thermally and chemically

insulated from exhaust gas. Consequently, light-off of the catalyst is extended while its reactivity is decreased.

As understood by one skilled in the art, the present invention of claims 9, 36 functions differently than DeAngelis. DeAngelis does not describe a honeycomb with a MOR strength of at least 200 psi. Further, inclusions, which are a necessary element of DeAngelis, prevent DeAngelis from having a MOR strength of at least 200 psi. Inclusions reduce mechanical strength by reducing the actual amount of material and/or by acting as stress concentrators. DeAngelis requires inclusions as a necessary element of the claims. A high MOR strength is very important to commercial application of the substrate and is not a mere design variation. Not surprisingly, DeAngelis does not report MOR strength of its catalyst support. DeAngelis does not teach or suggest a honeycomb catalyst support having a MOR strength of at least 200 psi. For these reasons, respectfully, claims 9 and 36 are allowable over DeAngelis.

Claims 1, 2, 4, 6, 8-9, 31 and 36 are allowable over DeAngelis.

2. Allowable Subject Matter

Claim 3 has been allowed. Claims 32-35 depend from claim 3 and are allowable as dependent claims of an allowable claim.

3. Conclusion

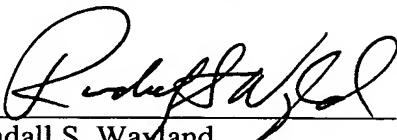
Applicants believe pending claims 1, 2, 4, 6, 8-9 and 31-36 are allowable and patentable over US 4,888,317 to DeAngelis. Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Applicants believe that a one (1) month extension of time is necessary to make this Reply timely. Should Applicants be in error, Applicants respectfully request that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

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Please direct any questions or comments to Randall S. Wayland at 607-974-0463.

Respectfully submitted,



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